[illegible].4
80 c

A SHORT

ACCOUNT
OF THE
EYE
AND
NATURE of VISION.

Chiefly deſigned to Illuſtrate the

USE and ADVANTAGE
OF
SPECTACLES.

WHEREIN

Are laid down Rules for chuſing GLASSES proper for remedying all the different Defects of SIGHT.

AS ALSO

Some REASONS for preferring a particular kind of GLASS, fitter than any other made Uſe of for that Purpoſe.

The THIRD EDITION.

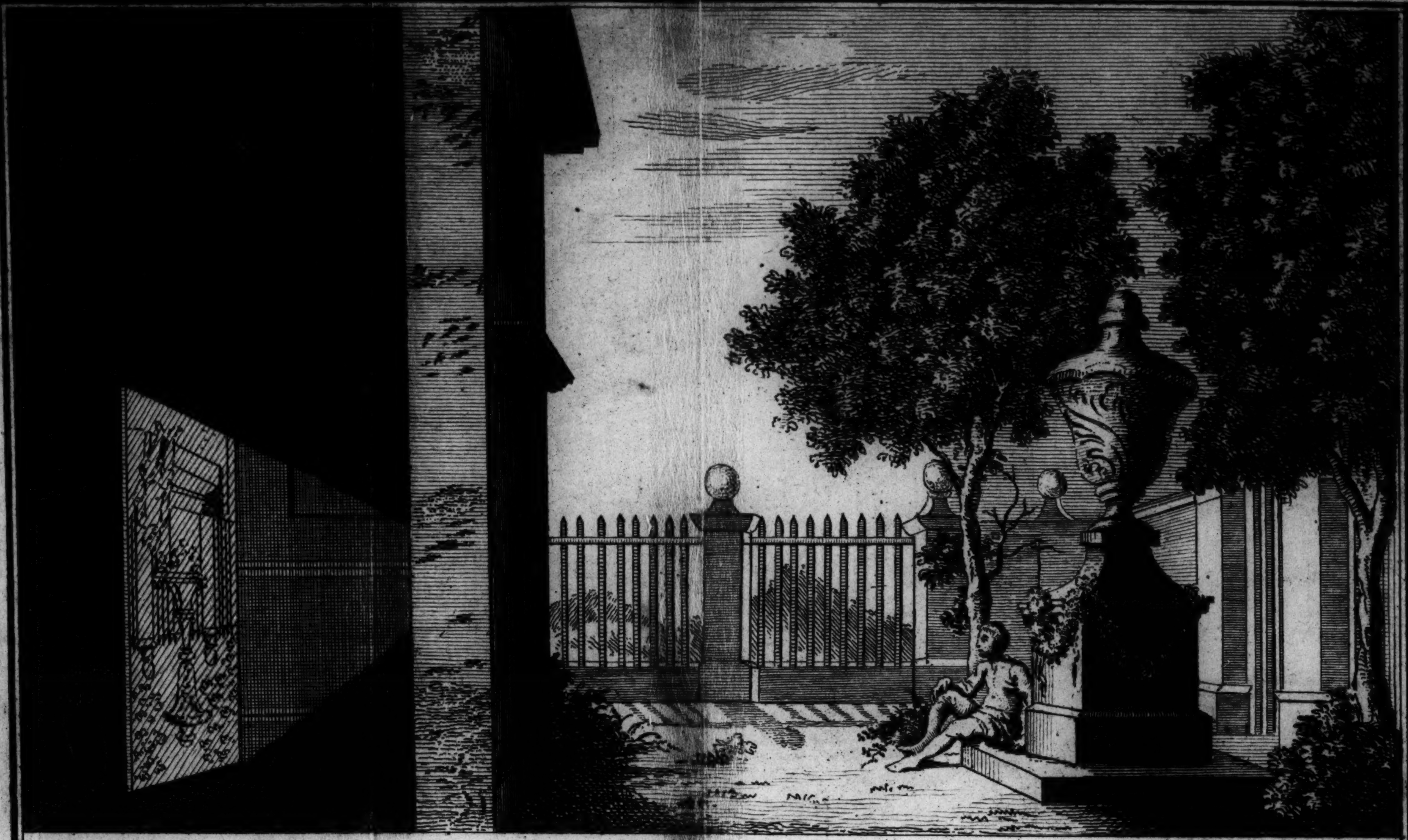
By *JAMES AYSCOUGH*, Optician.

LONDON:
Printed by E. SAY, for A. STRAHAN, in *Cornhill*; J. ROBINSON, *Ludgate-Street*; P. STEVENS, facing *Stationers-Hall*; Mrs. DODD, without *Temple-Bar*; and J. JOLLIFFE, in St. *James's-Street*. M DCC LIV.

MVSEVM
BRITAN
NICVM

2 k

Fig. 1.



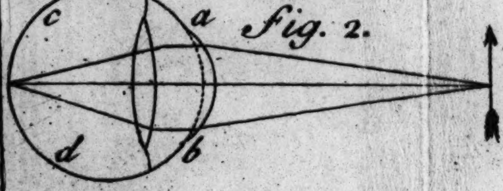


Fig. 2.

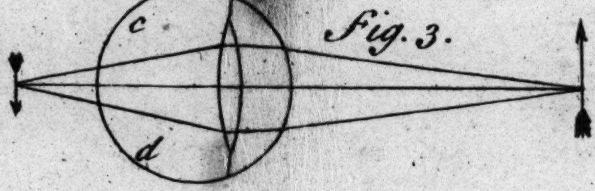


Fig. 3.

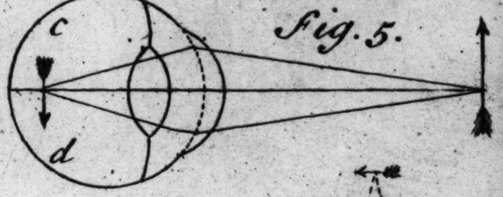


Fig. 5.

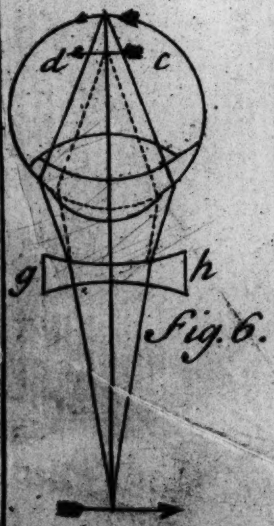


Fig. 6.

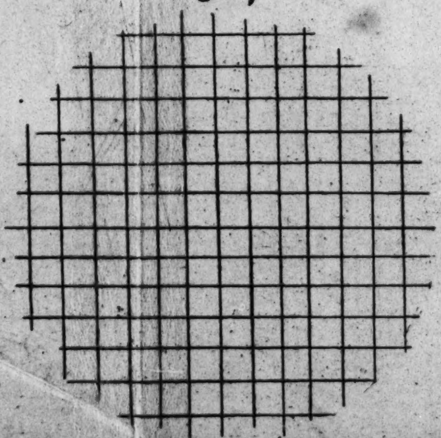


Fig. 7.

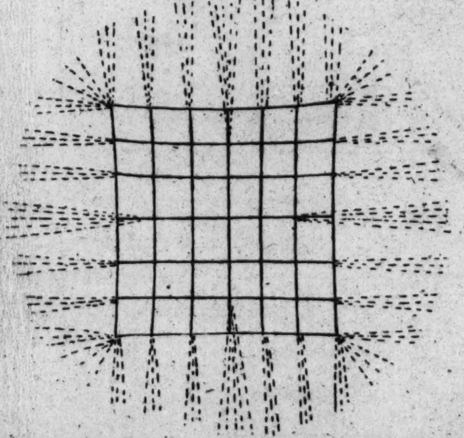


Fig. 8.

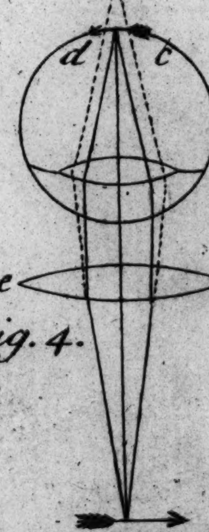


Fig. 4.

J. Mynde sc.

A SHORT ACCOUNT OF THE EYE AND NATURE of VISION.

THE Deſign of the following Sheets being chiefly intended to illuſtrate the Uſe of Spectacles for helping defective Eyes, and to inſtruct People labouring under theſe Diſadvantages how to judge of the Nature of their Infirmity, and learn them how to apply a proper Remedy; I ſhall therefore endeavour to write ſo, as to be underſtood by

People of all Capacities, and ſhun all Terms of Art as much as poſſible.

As to the Nature of Viſion, I ſhall not attempt to give any Account, how the Rays of Light proceeding from Objects, and conveyed through the Organ of the Eye, are propagated into the Brain; nor pretend to ſay what Membrane is the Seat of that Senſation, nor how theſe Senſations are perceived; that being properly an Inquiry into the Faculties of the Soul, a Work too mighty for Man; which has baffled the Reſearches of the moſt acute; ſeeing all their Endeavours to explain, have ſerved to puzzle more than convince, and their Concluſions, at laſt no better than bare Conjectures, prove, *That the Works of the Almighty are wonderful, and his Ways paſt finding out.*

Neither ſhall I attempt to give an anatomical Account of the Eye, as to the particular Muſcles, the different Coats and Humours, that compoſe that wonderful Machine; but, only conſidering it as an Optical Inſtrument, compare it to one of human Invention, and thence propoſe to illuſtrate how the Images of external Objects are painted on the *Retina* or back Part of it, and ſhow how any Imperfections ariſing from a bad Form are to be helped by the means of proper Glaſſes.

When we look on the Eye as an Optical Inſtrument; whether we conſider its external or internal Parts, its Motion, Size, or Situation, it is all Admiration! Look on the Eyelids, how admirably they are contrived for the Defence, as well as the Eaſe of that glorious Machine; ſerving as a Screen to ſhut out the Light, while the Soul lies aſleep, without which it muſt have been always kept on the Bend, and uſeleſs Images formed on the *Retina*, without producing any Senſation! How curiouſly their Edges are bound about with fine Cartilages, which ſerve to ſtrengthen, as well as enable them to ſhut the cloſer; and theſe again fortified with a Row of ſtiff Hairs, judiciouſly turned different Ways, to warn the Approach of Dangers, and alſo by their Interpoſition (like a dark Glaſs) moderate too exceſſive Light, while they admit as much as is neceſſary to ſhow the Object diſtinctly!

If we examine the Coats and Humours, we ſhall find them ſtill as wonderful in their Contexture, as admirably placed, and as curiouſly adapted to the Place and Buſineſs they are to perform: The delicate Tranſparency of the *Cornea*, ſo formed as to make the Light fall properly on the Cryſtalline, ſo as to be collected by it on the *Retina*. A Lens no leſs curious in its Formation, than wonderful in its conſtituent Parts; which, as Mr. *Leeuwenboek* has made appear, conſiſts of a vaſt Number of thin Plates and Scales lying one upon another, and every one of theſe made up of one ſingle Fibre or fineſt Thread, wound in a moſt ſtupendous Manner, this Way and that Way, ſo as to run ſeveral Courſes, and meet in as many Centers, and yet not interfere or croſs one another in any one Place. The Aqueous and Vitreous Humours furniſh equal Aſtoniſhment, tending to miniſter in a like wonderful Manner to the Perfection of this noble Machine, by keeping the whole extended to its proper Form, as well as aſſiſting it in its refractive Power; at the ſame Time they eaſily yield to a Change of its Figure, and the Motion of the Cryſtalline backward and forward, in adapting itſelf to ſee at different Diſtances.

The Proviſion that the admirable Artiſt has made for the Preſervation of this perfectly well formed Organ, is every where proportioned to the Uſe and Excellency of it, and the inward Texture delicate and tender, in Proportion to their tender and curious Purpoſes. How judiciouſly is the Inſidet darkened that it may not reflect or diſturb the Rays! and how wonderful does the Aperture of the *Iris* adjuſt itſelf to every different Degree of Light! When we conſider, that this Inſtrument performs all theſe Things of itſelf, from the Nature of its Formation, without any Direction or Aſſiſtance from the Mind; how muſt we be ſtruck with Aſtoniſhment, and neceſſarily convinced, that ſuch a Superſtructure can be no other than the Work of an infinitely ſkilful Workman, where every Circumſtance conſpires to a Demonſtration, that the nobleſt Works of human Invention are no more to be compared to the ſmalleſt Appendage of this moſt curious Minutia, than divine Perfection to finite Ignorance and Impotence!

Such is the Organ of the firſt, the nobleſt, the moſt elegant of all our Senſes: It is on the *Retina* that are painted all the Glories of the Heavens, and Beauties of this lower World; it is by Means of this Organ we contemplate the ſtupendous Works of its Creator, every where extended round us in the Firmament; and through it we admire the Immenſity of his Skill in the Formation of the minuteſt Thing that exiſts. From this Senſe we receive the greateſt Entertainment, the higheſt Delight; and without it moſt of our other Faculties would in a great Meaſure be rendered uſeleſs. An Animal endued with Life and Motion, without Sight, how could he judge to advance this, or retire that Way, to enjoy any uſeful, agreeable, or pleaſant Object; or ſhun a nauſeous, or diſagreeable Stumbling-block that lay in his Way? How could the Race of Men ſearch after Food, plough the Depth in queſt of Knowledge, Riches, or even Luxury? Or, in a State of Blindneſs, how could they ſhun Ten Thouſand Dangers, that always every where ſurround them?

The Uſe of this Senſe, the Benefit of which we experience every Moment, needs be no further inſiſted on, ſince the Loſs of it is always accounted amongſt the greateſt of our Misfortunes; and as Ignorance is reckoned the Blindneſs of the Soul, ſo utter Darkneſs, in a figurative Senſe, is declared to be the Portion of thoſe who ſhall never ſee God. How thankful then ought thoſe to be, who enjoy in full Perfection this ineſtimable Bleſſing? And how much to be commiſerated are they, who either from natural Defects, or Decays through Age or Diſeaſes, partake of ſome Degree of Blindneſs? An Attempt therefore of this Kind will be eaſily excuſed, and candidly received, by all thoſe who wiſh well to their Fellow-Creatures.

As I do not write this for the Inſtruction of Philoſophers, Anatomiſts, or Opticians, who may underſtand theſe Things better than I pretend to do; but for the general Uſe and Advantage of thoſe who have not had the Opportunity from their Education to know the Laws of Refraction from the Rules of Opticks; it will therefore be neceſſary to premiſe ſome Things here.

The Rays of Light proceeding from any luminous, or illuminated Body, diverge, in all Directions, in ſtraight Lines.

From the Rules of Opticks it is demonſtrated, that, in order to form an Image, theſe diverging Rays muſt be collected again into Points.

That the Rays of Light paſſing through any Medium, and falling on any diaphanous Body (as Glaſs, *&c.*) of a denſer Nature, are bent or crooked, and take another Direction, and *vice verſa.*

That Rays from any Body falling on Glaſs, *&c.* made into a globular or convex Form, (ſuch as a common magnifying Glaſs) are bent ſo as to meet in a Point behind it; which

Point is called its Focus, and at that Place there is always an Image formed.

Every Eye has a Focus, either in or beyond it, where the Images of all external Objects are formed by its refracting Power.

From what has been ſaid, the Nature of Viſion, and Uſe of Spectacles, will be moſt eaſily explained by the common Experiment of the Dark Chamber, or, as is it uſually called, the *Camera Obſcura*; which is this: In the Room that is darkened, let a Hole be made in the Door or Window-Shutter, in which Hole place a Convex Lens (or common magnifying Glaſs); then holding a Sheet of white Paper within the Room, at a proper Diſtance from the Hole (which will be found by Trial) you will ſee on the Paper the Pictures of all external Objects, in their juſt Proportions and proper Colours, only they will be upſide down, as in Fig. I.

If the Paper remain in the ſame Place, and in the room of the aforeſaid Glaſs or Lens one that is flatter be uſed, the Picture upon the white Paper will then be confuſed; but by placing a Convex Spectacle-Glaſs before the Lens of a due Convexity, the Image on the Paper will again be rendered diſtinct. If a more Convex Lens than the firſt be uſed, the Image on the Paper will again be confuſed; but may be rendered diſtinct, by placing in this Caſe a Concave Spectacle-Glaſs before the Lens,

The Reaſon of the indiſtinct Picture in theſe Caſes, is, when the flatter Glaſs is uſed, the Rays paſſing through it are not enough refracted, (or bent) but would meet at Points beyond the Paper; and in the other Caſe are too much bent, ſo as to meet too ſoon, and ſhort of the Paper. The Paper being fixed, that Diſtance is not the proper Focus of any of theſe Lenſes; but the Image is rendered diſtinct, as in the Experiment, by the Help of proper Glaſſes.

This Experiment repreſents the Manner of Viſion by the Eye; for the *Cornea*, or outſide Coat, being of a Convex Form, as *a b*, Fig. II. reſembles the Lens placed in the Hole in the Window-Shutter; and on the Concavity of the Bottom of the Eye *c d* is expanded a fine Membrane called the *Retina*, which reſembles the white Paper: On this Membrane the Pictures of all external Objects are formed. When the Pictures are formed diſtinct on the *Retina*, then the Objects appear clear and diſtinct; if the Pictures on the *Retina* are confuſed, then the Objects appear hazy and confuſed: This is confirmed by taking off from the Bottom of the Eye the outward Coat called the *Dura Mater*, and applying a Piece of thin Paper in place of it, for we can then ſee Pictures of Objects lively painted on it: And according as theſe Pictures are perfect or imperfect, the Objects are ſeen perfectly or imperfectly; but if the Eye be tinged with any Colour (as in the Diſeaſe of the Jaundice) ſo as to affect the Pictures in the Bottom of the Eye with that Colour, then all Objects appear of the ſame Teint.

From hence we may eaſily ſee the Uſe of Spectacles; for, when the Eye is of a proper Convexity or Roundneſs, Rays from any external Objects falling upon it will be collected on the *Retina*, and form a diſtinct Image there, as is repreſented in Fig. II. But, if from the original Form, or through the Decay of the Humours by Diſeaſes, or Old-Age, the Eye be of too flat a Figure, the Rays will not be refracted enough, but bent ſo as to meet at a Point beyond the *Retina*, as in Fig. III. This Defect (as in the Experiment) is helped by the Interpoſition of a Spectacle-Glaſs, *e f*, Fig. IV. which bends the Rays a little before they fall on the Eye, and giving it leſs to do, are then collected properly on the *Retina*; whereas, without the Help of that Glaſs, they would have proceeded, as repreſented by the pricked Lines in the ſame Figure: And to have produced diſtinct Viſion, the *Retina* ſhould be removed as far back as where they meet.

When the Eye is too round, as in ſhort-ſighted People, the Rays are too much bent, and convene before they come to the Bottom of the Eye, as in Fig. V. The Plumpneſs of the Eye in this Caſe is rectified by a Concave Spectacle-Glaſs, *g h*, Fig. VI. which bending the Rays a little outward, makes the Light fall on the Eye properly for its refractive Power, ſo as to be collected in Points on the *Retina*, and form a diſtinct Picture there.

This in general is the Manner in which the Defects of the Eye are remedied by the Uſe of Glaſſes: But theſe Defects are neither the ſame in different Perſons of the ſame Age, nor in the ſame Perſons at different Ages; neither do they proceed from the ſame Cauſe; ſome being natural, ſome acquired, and many the Conſequence of Diſeaſe; but from whatſoever Cauſe they ariſe, if the Imperfection lies in the Shape, they can be rectified by proper Glaſſes, as has been ſhewn.

A bad Form may be acquired, by look-much, either at very remote, or too near

Objects: In the former Caſe we flatten the Eye a little, and in the latter we draw it up into a more Convex Form, to ſee diſtinctly: In Time the Eye will acquire either Conformation, and retain a fixed Form, too flat or too globular for Objects at a moderate Diſtance.

This is confirmed every Day, in the Caſe of Engravers, Watchmakers, Chaſers, *&c.* who, by frequently forcing their Eyes into too Convex a Figure in order to ſee minute Objects, at laſt have their Eyes ſettled to that Configuration, and ſo become ſhort-ſighted, eſpecially if they are uſed to theſe Employments when young, while the Coats of the Eye are tender and pliable.

On the contrary, Sailors and Huſbandmen, by looking moſtly at diſtant Objects, are rarely, if ever, ſhort-ſighted, and ſoon want the Aſſiſtance of Convex Glaſſes; becauſe, by adapting the Eye to ſee remote Objects, it fixes at laſt in a Shape too flat for near Diſtances.

From hence we may ſee, that the Defects of the Eye will likewiſe alter by Habit, and even that theſe Defects may be remedied by Habit; and according as People accuſtom themſelves to ſuch Habits, they may either increaſe or diminiſh theſe Defects. Age in general alters the Form of the Eye, making the Eyes of moſt People grow flatter; but the Form of the Eye may be likewiſe flattened, by uſing Glaſſes of too great magnifying Power, which will reduce the Eye to as flat a Figure, as either Old-Age itſelf, or looking at diſtant Objects: On which Account no Perſon ſhould ever uſe Glaſſes that magnify more than what is abſolutely neceſſary to remedy the Defect for which they have Recourſe to that Help: For, though they can ſee to read, by bringing the Paper nearer to the Eye, yet it muſt ſtrain it into ſuch a Figure, ſo as afterwards they can never ſee without ſuch Glaſſes. This I mention the rather, as many People think the chief Property of Spectacles conſiſts in making the Object appear very big; which is a great Error, and of worſe Conſequence than Glaſſes that do not magnify ſufficiently to ſupply the Purpoſe. Notwithſtanding what has been ſaid, purblind Perſons ſeldom find any conſiderable Alteration in their Eyes, and I have even obſerved, contrary to the general Rule, that they ſometimes grow rather more ſhort-ſighted.

Since therefore the Defects of the Eye, and the Glaſſes proper to remedy thoſe Defects, vary ſo much, I ſhall now ſhew how People may judge when there is a Neceſſity to apply to theſe Helps, and alſo lay down ſome Rules by which every one may chuſe, not only good Glaſſes in their Kind, but ſuch too, as are beſt ſuited to the Form and Shape of their own Eyes.

Every good Eye has one certain Diſtance (or nearly ſo) of ſeeing a common Size Print to read with Eaſe; and when the Eye begins to grow ſo flat, as to require the Aſſiſtance of Spectacles, they will find themſelves obliged to hold a Book at a greater Diſtance; and they may obſerve alſo, when they read, write, or work any long Time, a Sort of Dizzineſs like a Cobweb will appear before their Eyes; and likewiſe, if they read by Candlelight, they will find it neceſſary to hold the Paper behind it.

Theſe are the Signs of the Want of Spectacles; and whenever this appears to be the Caſe, no Perſon ſhould be without them; for the endeavouring to ſee what they cannot without great Difficulty, ſtrains and weakens the Eye, and by this they may receive more Injury in a Month or two, than they would otherwiſe do in as many Years, with the Aſſiſtance of proper Glaſſes, which would not only aſſiſt the Eye, but render Viſion eaſy and pleaſant.

In order therefore to make a proper Choice of Spectacles, that is, to judge what Glaſſes are of a due Degree of Convexity or Concavity, ſo as to aſſiſt the Eye properly for its refractive Power, hold a ſmall Print at the Diſtance at which you was uſed to ſee diſtinctly when your Eyes were good, which with moſt People is about Ten or Twelve Inches; then chuſe a Pair of Spectacles of ſuch a Degree of Convexity, as renders the Letters as plain as they uſed to appear before your Sight was defective: If you chuſe them too young, *i. e.* not Convex enough, they will ſcarce remedy the Defect; and you will not ſee diſtinctly, unleſs the Print is ſo far off, that the Letter will appear rather too ſmall to be read. If you chuſe them too old, *i. e.* too Convex, you will then be obliged to flatten the Eye to compenſate their over-great Convexity, and thereby be in Danger of increaſing the Defect.

For ſhort-ſighted Perſons, the beſt Way is to look through a Concave Lens at ſome diſtant Object; and the leaſt Concave of all the Glaſſes, through which you can ſee diſtinctly, is the beſt.

Theſe Trials always ought to be made where you can have the greateſt Choice of Glaſſes: But thoſe who live in the Country, at too remote a Diſtance from that Conveniency, may be fitted by the following Method, *viz.* let the Perſon take a common Print, and move it to and from the Eye, 'till he ſees diſtinctly, then meaſure exactly that Diſtance, (from the Eye to the Paper) and by ſending an Account thereof to a proper Workman, they may be fitted to a ſufficient Degree of Exactneſs.

But, as in many curious Pieces of Workmanſhip there is an abſolute Neceſſity of viewing the Object under a large Angle, in order that the moſt minute Parts may be obſerved; in this Caſe, Glaſſes of a larger magnifying Power, than what is proper for common Purpoſes, muſt be uſed; and if the Work be brought nearer to the Eye, its Form will not be much altered; but the ſhorter Time theſe Objects are viewed the better, for Reaſons before given.

Now we have ſpoke of the Nature of the Diſeaſe, and the Remedy; we have pointed out the Symptoms, and directed how to apply the Medicine: But, as in Phyſick the Quantum muſt be proportioned to the Quality of the Drug, and altered according as it is good or bad of its Kind, ſo here the Glaſſes may be very judiciouſly choſen, as to their Degree of magnifying Power, and ſtill they may be very bad Spectacles; for although they may aſſiſt the Eye in ſome Meaſure, as to its refractive Quality, yet they will inſenſibly hurt it in a greater Degree in ſeveral other Caſes: Therefore we ſhall now proceed to ſpeak of the Properties of the Glaſſes themſelves, and detect whether the Fault lies in the Materials, or is owing to the Artiſt; and give ſuch Rules, as every Perſon may chuſe, examine, and judge for themſelves; which were formerly known only to Connoiſſeurs and Workmen.

In ſpeaking of the Imperfections, we ſhall have an Opportuity of obſerving the Properties of good Glaſſes, and point them out as we go along.

The Imperfections of Glaſſes are either owing to the Artiſt, or the Materials they are made of: The Workmen often through Hurry, Careleſſneſs, or Want of Skill, put them out of their Hands of an untrue Figure or very bad Poliſh, and yet in ſuch a Manner as not to be diſcovered but by very good Judges; whereas good Glaſſes ought to be very truly formed, and as exquiſitely poliſhed.

The Errors that ariſe from the Materials are often owing to a vaſt Number of Veins in it; but particularly, to an offenſive glaring Light, occaſioned by the Colour of the Glaſs [commonly made Uſe of for that Purpoſe]; ſo we ſhall ſpeak to all theſe Points ſeparately. And firſt,

To examine the Figure, view any common Print through the Spectacles, holding the Glaſs at a good Diſtance from the Eye, and removing it gradually from the Paper, if the Glaſs be of a true Figure, the Print or Object will all appear confuſed at the ſame Time; but if falſe, it will appear diſtorted about the Edges of the Glaſs, while it remains diſtinct in the Middle. Thus if you view croſs Lines, which form ſmall Squares, as in Fig. VII. through a true-ground Glaſs, it will appear perfectly like the Original, only bigger and bigger as you gradually remove the Glaſs, till you come beyond its Focus, where all Parts will appear indiſtinct together: Whereas, through a Glaſs not truly ground, the Squares in the Middle will appear with ſtraight Sides, but thoſe near the Edges crooked, of different Bigneſs, and confuſed, as in Fig. VIII.

To diſcover the Veins in Convex Glaſſes, place a Candle from you about the Diſtance of Five or Six Yards, then looking through the Glaſs, move it from the Eye, till you find it full of Light, and then will be ſeen every Vein and Speck in it. Theſe Veins always diſtort Objects; but Specks, which are only opake Spots, intercept but an inconſiderable Part of the Light, doing no other Damage. At the ſame Time you will eaſily ſee if there be any Fault in the Poliſh.

As to the Colour, it has been found that the common white Glaſs gives an offenſive glaring Light, very prejudicial to the Eyes; and on that Account green and blue Glaſs have been adviſed, though they make every Object appear with their own Hue; for theſe Reaſons, that white Bodies in general, and all Objects ſtrongly illuminated, are more painful to look upon than Objects tinged with theſe Colours.

With what more Eaſe and Pleaſure do we view the azure Sky at the Dawn, or the green Fields in the Spring, than the Earth covered with Snow, and illuminated by the Noon-day Sun?

But Experience teaches us, the fineſt Theories are liable to Objections, and muſt never be fully admitted till confirmed by Practice; ſo Glaſſes of theſe Colours have been found ineffectual, excepting in Caſes where the natural Defect of the Eye requires ſuch; or for Workmen looking on luminous Objects, to whom they are of very great Service, rendering thoſe Objects eaſy to be viewed; but to others are very prejudicial, making the Objects too dark through the Deepneſs of the Tinge of the Glaſs, and even affecting the Eye in ſuch a Manner, that all Objects appear of the ſame Tinct for ſome Time after they are uſed.

Upon theſe Conſiderations, ſome Time ago I was induced to make Trial of a new kind of Glaſs, and recommend it to the Publick, as being fitter for the Purpoſes of Spectacles than any other Sort whatſoever; on theſe Accounts, it is harder, freer from Veins, and being of a greeniſh Caſt, takes off the glaring Light ſo much complained of in the White, yet ſo tranſparent as not to be liable to the Objections ſo juſtly made to thoſe of deeper Colours.

That it is harder, is evident, from the Difficulty there is in working it; ſince Artificers can grind near double the Number of white Glaſs, that they can do of this Sort in the ſame Time: And as every one the leaſt converſant in Opticks knows the greateſt Exactneſs in Figure is requiſite to make a good Object-Glaſs in a long Teleſcope; ſo that this Sort makes excellent Glaſſes for that Purpoſe is now known by the Experience of all Workmen, while it is impoſſible to make a tolerable good one out of the white Glaſs.

It is likewiſe known, that a hard Body of a homogeneous Nature can be formed into a truer Figure, than one of a ſoft unequal Subſtance; where the ſofter Parts, in forming or poliſhing, always work away faſter than the hard, and by that Means leave an unequal Surface. Such a Subſtance can never anſwer in great Teleſcopes, where every Error in the Image formed by the Object-Glaſs, is ſo greatly magnified by that next the Eye. From hence it appears, that the white Glaſs is not only of a ſofter Body, but of a more heterogeneous Nature, and at the ſame Time is a Proof of the Hardneſs and equal Solidity of the Kind recommended.

That it is freer from Veins, we are certain from Examination; for in comparing any Number with the white Glaſſes, as directed

But Experience teaches us, the fineſt Theories are liable to Objections, and muſt never be fully admitted till confirmed by Practice; ſo Glaſſes of theſe Colours have been found ineffectual, excepting in Caſes where the natural Defect of the Eye requires ſuch; or for Workmen looking on luminous Objects, to whom they are of very great Service, rendering thoſe Objects eaſy to be viewed; but to others are very prejudicial, making the Objects too dark through the Deepneſs of the Tinge of the Glaſs, and even affecting the Eye in ſuch a Manner, that all Objects appear of the ſame Tinct for ſome Time after they are uſed.

Upon theſe Conſiderations, ſome Time ago I was induced to make Trial of a new kind of Glaſs, and recommend it to the Publick, as being fitter for the Purpoſes of Spectacles than any other Sort whatſoever; on theſe Accounts, it is harder, freer from Veins, and being of a greeniſh Caſt, takes off the glaring Light ſo much complained of in the White, yet ſo tranſparent as not to be liable to the Objections ſo juſtly made to thoſe of deeper Colours.

That it is harder, is evident, from the Difficulty there is in working it; ſince Artificers can grind near double the Number of white Glaſs, that they can do of this Sort in the ſame Time: And as every one the leaſt converſant in Opticks knows the greateſt Exactneſs in Figure is requiſite to make a good Object-Glaſs in a long Teleſcope; ſo that this Sort makes excellent Glaſſes for that Purpoſe is now known by the Experience of all Workmen, while it is impoſſible to make a tolerable good one out of the white Glaſs.

It is likewiſe known, that a hard Body of a homogeneous Nature can be formed into a truer Figure, than one of a ſoft unequal Subſtance; where the ſofter Parts, in forming or poliſhing, always work away faſter than the hard, and by that Means leave an unequal Surface. Such a Subſtance can never anſwer in great Teleſcopes, where every Error in the Image formed by the Object-Glaſs, is ſo greatly magnified by that next the Eye. From hence it appears, that the white Glaſs is not only of a ſofter Body, but of a more heterogeneous Nature, and at the ſame Time is a Proof of the Hardneſs and equal Solidity of the Kind recommended.

That it is freer from Veins, we are certain from Examination; for in comparing any Number with the white Glaſſes, as directed

Page 19, you will find ten in the White full of Veins to one of theſe; and likewiſe the Veins in this Glaſs are ſo ſmall in Compariſon of the other, that the Errors ariſing from them muſt be leſs in Proportion.

That theſe Spectacles muſt be dearer, will appear from the greater Charge ariſing from the working, as well as from the higher Price of the Materials; but, their being ſo much preferable in every Shape to the common Glaſs, which Experience and the univerſal Approbation they have met with ſufficiently confirms, makes them cheaper upon the whole, ſince the Difference of the Price is ſuch a Trifle in Compariſon to their ſuperior Qualifications.

Notwithſtanding the Oppoſition that was made to this Sort of Glaſs, ſome time ſince, by a few People of the Trade, yet ſome of the moſt violent of theſe Oppoſers are now ſo much convinced of the ſuperior Excellency of it, that they themſelves make Uſe of it for the ſame Purpoſes.

Even at that Time, ſome of them acknowledged the Properties of this Glaſs, though they oppoſed it in Publick (like the *Epheſian* Goldſmiths, who raiſed a Clamour againſt Chriſtianity, leſt it ſhould hurt the Craft, by deſtroying that lucrative Buſineſs of Shrine-making) giving it as a Reaſon, that it would ſpoil the Sale of Spectacles made of *Rock Cryſtal* and *Brazil Pebbles*, which for ſome time had been much cried up for their extraordinary Virtues, while, in reality, there is nothing to recommend them but their exorbitant Price, and the no ſmall Gain which they brought to the Craftſmen.

For, though they are hard, and take a fine Poliſh, they have a glaring Whiteneſs, and a Grain like the Iſland Cryſtal, and like that too a double Refraction *; and as was obſerved before of the White Glaſs, it is impoſſible with theſe Subſtances to make Lenſes either for Teleſcopes or Microſcopes; and conſequently can never be good Spectacles, though their Faults may not be ſo eaſily diſcovered in ſo ſimple an Inſtrument.

Upon the whole, the Motive of recommending this Glaſs was no other than being fully convinced of its Properties from the above Reaſons, nor was there any Pretence to an Invention; only, happening to be the lucky Diſcoverer, I thought it my Duty to communicate it to the Publick. Neither is it true, that this Glaſs was at all Times formerly uſed, and for the moſt ordinary Goods, as has been falſely inſinuated, ſeeing the Price would not anſwer for the Glaſſes ſold by Pedlars and common Hawkers.

---

* See Sir *Iſaac Newton*'s Opticks, Book III. Quere 25.

As the moſt beneficial Diſcoveries to human Life have often been the Work of Chance, and though very few Philoſophical or Optical Inſtruments made of late, deſerve the Name of Invention, yet there are Numbers of them that may be greatly improved; and he who does his beſt Endeavours, and communicates them freely, is at leaſt Praiſe-worthy for his good Intentions, *eſpecially on ſuch a Subject:* So I ſhall conclude with the Words of Mr. *Molineux*; "Were there no further Uſe of *Dioptricks*, "than the Invention of *Spectacles* for the "Uſe of defective Eyes; whether they be "thoſe of *Old Men*, or thoſe of *Purblind* "*Men*; I ſhould think the Advantage that "Mankind receives thereby, inferior to no "other Benefit whatſoever, not abſolutely "requiſite to the Support of Life. For as "the Sight is the moſt noble and extenſive "of all our Senſes; and as we make the "moſt frequent and conſtant Uſe of our "Eyes in all the Actions and Concerns of "human Life; ſurely that Inſtrument that

" relieves the Eyes when decayed, and ſupplies their Defects, rendering them uſeful, " when otherwiſe almoſt uſeleſs, muſt needs, " of all others, be eſteemed of the greateſt " Advantage. In what a miſerable Condition " do we count thoſe, in whom it hath pleaſed " the *great Contriver of the Eyes and Sight* " to ſhut theſe two little Windows of the " Soul? And we may imagine, that they, in " whom theſe Lights are but *partly* obſcured, do in ſome Meaſure partake of the " Miſeries of the Blind. How melancholy " is the *Condition* of him, who only enjoys " the Sight of what is immediately about " him? With what Diſadvantage is he engaged in moſt of the Concerns of human Life? " Reading is to him troubleſome, War more " than ordinary dangerous, Trade and Commerce toilſome and unpleaſant: And ſo " likewiſe, on the other Hand, how forlorn " would the latter Part of moſt Men's Lives " prove, unleſs Spectacles were at Hand to " help our Eyes, and a little formed Piece " of Glaſs ſupplied the Defects of Nature? " The curious Mechanic, engaged in any " minute Works, could no longer follow his " Trade than till the Fiftieth or Sixtieth " Year of his Age; the Scholar no longer " converſe with his Books, or with an abſent Friend in a Letter: All after would

" be melaancholy Idleneſs, or he muſt con-
" tent himſelf to uſe another Man's Eyes
" for every Line. Thus forlorn was the
" State of moſt *Old Men*, and many *Young*,
" before this admirable Invention; which,
" on this very Account, can never be prized
" too highly."

MVSEVM
BRITAN
NICVM

FINIS.

* * *

Advertiſement.

At *JAMES AYSCOUGH*'s,

At the Golden-Spectacles *and* Quadrant, *in* Ludgate-Street, LONDON,

THERE are, for the greater Conveniency of fitting People of all Ages, above thirty different Kinds of Spectacles, each magnifying more than the other, ſet in all Manner of neat and commodious Frames: Where all Perſons, among ſo large an Aſſortment, may fit themſelves to any Degree of Exactneſs, or, by ſending an Account from the Country (as directed in this Book) can be fitted as well as if they were on the Spot. He has likewiſe ſome double-jointed Frames, entirely of a new Contrivance, being an exceeding great Improvement, ſeeing they obviate all the Objections made to the common Spring-Spectacles, as they neither preſs upon the Noſe nor the Temples; the Complaint againſt theſe being the Preſſure they cauſe on that Place, which ſtops the Circulation of the Blood, and thereby occaſions to many People violent Head-Aches.

Where alſo may be had,

All Sorts of Optical, Mathematical, and Philoſophical Inſtruments; particularly, Re-

fracting Teleſcopes, which, from ſeveral late Tryals at Sea by the moſt experienced and competent Judges, are allowed greatly to excel any other yet made in England.

Great Choice of Barometers, either Portable or Standard, accurately fitted up in neat, commodious, and ornamental Frames, at all different Prices, from Fifteen Shillings, to Five Guineas and upwards.